

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Appln. No. 10/006,583

AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph bridging pages 1 and 2 with the following paragraph:

The known application layer protocols contemplate the use of complete hardware solutions, or they have been developed ~~expressely~~expressly for special types of microcontrollers. Moreover, in order to be able to realize complex control systems with distributed data, they are not employable in architectures that use microcontrollers with reduced system resources.

Please replace the second and third full paragraphs of page 2 with the following paragraphs:

Other protocols, which do not utilize such data transfer modes, provide for a ~~negoziation~~negotiation between the entities that have to exchange a data item to determine the format and the identification of the message to be utilized.

An example of an electronic device that must be controlled and supervised could be an apparatus that receives, transmits and processes signals in telecommunications radio link systems. In such apparatus it is necessary to control the alarms that are possibly generated, and it is necessary to collect and analyze the various operating states and carry out configurations.

Please replace the part of the specification from the last paragraph of page 2 to the section of Brief Description of the Drawings with the following paragraphs:

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It is a further object of the present invention to provide a method of controlling the ~~correct~~correct communication between the plurality of controlled entities and the controlling entity.

These and other objects are achieved by an application layer method of managing the communication between entities which is not connection-oriented but is of a connectionless type.

The present invention provides a method of providing the communication between two or more control units of a control apparatus that controls at least one electronic device which comprises two or more peripheral units, wherein the method comprises the steps of: providing a common bus; connecting the two or more control units of the control apparatus through the common bus; controlling, through each control unit, at least one peripheral unit of the device to provide data essential to the operation of the peripheral unit and to detect possible data variations in the peripheral unit; and providing a master controller connected to the common bus. Each of the control units carries out the following steps: submitting information concerning data consumed and provided by the peripheral units controlled by said control units, to the master control (CONT); and sending a message (M) over the bus (BUS) whenever SET data provided by at least one of the peripheral units controlled by the control units varies.

The present application also provides a computer program comprising program code adapted to perform one or more of the steps of the method described above.

The present application further provides a computer-readable medium comprising computer program code adapted to perform one or more of steps of the method described above.

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The present application further provides an apparatus for controlling an electronic device which comprises two or more peripheral units, the apparatus comprising: two or more control units, each of which controls at least one peripheral unit of the device to provide data necessary for the operation of the peripheral unit and detect possible data variations of the peripheral unit; and a common bus (BUS) for connecting the two or more control units (C). The apparatus further comprises a master controller (CONT) connected to the common bus (BUS). Each control unit is configured to submit to the master controller (CONT), information concerning data consumed and provided by the peripheral units that are controlled by the control units; and send a message (M) whenever the SET data provided by at least one of the peripheral units controlled by the control units varies.

The invention will ~~certainly result in being clear having read~~ be more clearly understood ~~from~~ the following detailed description, given by way of example ~~and not of limitation only~~, to be read with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 schematically shows ~~the a~~ configuration of ~~the an~~ apparatus for implementing the present invention; and

Fig. 2 shows ~~the an~~ example of a typical structure of ~~the a~~ messages that ~~are is~~ exchanged according to the present invention.

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Please replace the part of the specification from the first paragraph of page 4 to the paragraph bridging pages 4 and 5 with the following paragraphs:

For purposes of the present invention, every control unit will be defined as an agent unit while the master control unit will be defined as a manager unit. Therefore, the present invention provides a method of effectively managing the communication between a plurality of agents and possibly between agents and master.

According to the present invention, the various units, in order to perform the control of the device (DEV), exchange with each other messages (M) containing information (I). Each message is composed of one or more registers. In turn, the information contained in every message can substantially be of two types.

The first type of information, conventionally termed “set information”, is the information that an agent acquires from its peripheral unit and which it makes available to one or more of the agents connected thereto, which agents use such information to drive ~~the~~their respective peripheral units. A message (relating to a certain agent) may comprise set information, in the sense that it may be totally/partially occupied by set information or may not contain any set information.

The second type, conventionally termed “get information”, is the information that an agent acquires from another agent and supplies to ~~the~~their own peripheral unit ~~associated therewith~~. A message (concerning a certain agent) may comprise “get information”, in the sense that it may be totally/partially occupied by get information or it may not contain any get information (in this case it would contain only set information).

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The first step of the method according to the invention consists in a submission step, i.e. a step in which every agent entity transmits to the manager the structure of its message (the agent communicates to the manager which part of the message is “get information” and which part is “set information”). In this way the manager is aware of both ~~provenience~~the source and destination of the various information.

Once this step is ended, the communication step proper between the various units with related message exchange, is started. A characteristic feature of the method according to the invention is that the method does not provide for establishing connections and for this reason it is termed connectionless. In accordance with the invention, in fact, every agent spontaneously sends a message whenever it detects the variation of a data in ~~its~~the peripheral unit (typically one or more cards) ~~controlled thereby~~, otherwise it does not send any message. The message with the “get information” at least partially modified is sent by the agent by utilizing the common bus.

Please replace the second full paragraph of page 5 with the following paragraph:

The structure of the message exchanged between the various agents comprises a first portion of message and a second portion of message. The first portion of message, called header, contains specific information of the protocol for implementing the services. In addition, it contains also information related to the source of information (the agent producing the data) and information concerning the destination of the information (the data consumer agent or agents). The information concerning the destination of the information can comprise a logic address for possibly representing a group of entities consuming the same data item. Naturally, the header

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comprises an ~~univocal~~unequivocal identifier of the information so that it can be ~~univocally~~unequivocally recognized by all the entities.

Please replace the part of the specification from the last full paragraph of page 5 to the last paragraph of page 7 with the following paragraphs:

Optionally, the header part of the message exchanged between ~~Entities~~entities contains control bits to keep the information exchange regularity under control.

A flow control step through a sequence counter is also provided. This control step is performed by the manager ~~E~~ntity ~~through~~with the cooperation of the various agent ~~e~~Entities. Every agent ~~e~~Entity, or the corresponding peripheral unit, comprises a counter that counts forward at each data sent. The increased value of the agent counter is written at a proper position into the header. Under regular (namely error-free or faultless) communication conditions, the manager will receive messages with the values increased in a progressive manner.

Under failure or simple temporary interruption of the communication conditions, the manager will receive messages with non-progressive values of the counter or it will not receive the subsequent messages (namely it will no longer receive messages with counter values greater than a certain last value). At any rate, the manager ~~E~~ntity will realize that at least one of the agent units ~~is~~has not provided ~~with~~ updated data. In this case the flow control step contemplates that the manager asks the agent which has not been able to send its data, to send ~~them~~the data again into the network so that all of the units making use of such a data will be able to keep

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themselves updated. If the agent is not able to do so, the manager will put at all the other agents' disposal the data that it ~~anyhow~~nonetheless has at its disposal (those as stored by it).

Therefore, according to the present invention, every agent has its own address. When an agent sends the content of its registers (namely messages containing get/set data) it associates a header containing the address of the various agents to which that data item is to be sent, with such registers. The same data are also sent to the manager, ~~but the peculiarity~~even though it is an aspect of the present invention ~~just resides in~~ that, once the start-up step has been performed, the manager is no longer essential to the operation.

In the event that a transmission problem arises, it is necessary to discern if the agent ~~E~~entity, that is no longer able to communicate, was a purely data consumer a data producer/consumer or a purely data producer ~~e~~Entity. If the ~~e~~Entity is purely consumer, it will no longer be able to receive data from the other units but this, after all, will not adversely affect the other units. If the ~~e~~Entity is partially a data producer and partially data consumer, the situation is more complicated since the other agent units that are ready to receive the data will not receive it: the method of the invention contemplates that these units will freeze with the last received data, waiting ~~it~~until the situation is restored. The same situation will occur ~~as soon as~~if the failed (or anyhow isolated) unit is fully producer.

The present invention may advantageously be implemented through a computer program comprising program code means adapted to perform one or more steps of the method when ~~said~~the program is run on a computer. Therefore, the scope is intended to cover such a computer program as well as a computer readable medium having a program recorded thereon, ~~said~~the

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computer readable medium comprising computer program code ~~means~~ adapted to perform one or more steps of the method when ~~said~~the program is run on a computer.

There have thus been shown and described a novel method and a novel apparatus for controlling/supervising electronic devices, in particular transceivers for radio link systems, which fulfills all the objects and advantages sought therefor. Many changes, modifications, variations and other uses and applications of the subject invention will, however, become apparent to those skilled in the art after considering the specification and the accompanying drawings which disclose preferred embodiments thereof. All such changes, modifications, variations and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention which is limited only by the claims which follow.